What is a Waste Anesthetic Gas (WAG)?

Waste anesthetic gas (WAG) most often refers to occupational (worker) exposure to anesthetic gas (e.g., isoflurane, nitrous oxide, desflurane, and sevoflurane) during a medical or surgical procedure. Contributors to WAG exposure include leakage from tubing, valves, seals, and gaskets; poor work practices/lack of training; poor ventilation; and ineffective gas-scavenging systems.

Health Effects of WAG Exposure

- **Acute effects** — dizziness, lightheadedness, nausea, fatigue, headache, irritability, depression
- **Chronic effects** — liver and kidney disease, birth defects, miscarriages
- **Reproductive Effects** — Visit the UCLA Occupational Health Services website or NIOSH for more information

The Cal/OSHA Permissible Exposure Limit (PEL) for WAGs is 2 ppm as an 8-hour time-weighted average.

If you suspect WAG levels in your work area exceed the Cal/OSHA PEL, minimize exposure following the guidelines below and/or contact EH&S Industrial Hygiene for exposure monitoring at 310-825-5689.

Minimize Exposure

Always work in a well-ventilated area and ensure air is 100% exhausted (i.e., not recirculated to other areas).

### HIGH RISK FOR EXPOSURE

- FILLING THE VAPORIZER
- OPENING INDUCTION CHAMBER
- ANESTHESIA SYSTEM NOT SERVICED: LEAKS!
- DIAPHRAGM MISSING, IMPROPERLY CUT, OR DETERIORATED
- IMPROPER NOSE CONE: NOT COAXIAL
- NO WAG MANAGEMENT SYSTEM
- STEREOTACTIC DEVICE
- BELL JAR
- RECOVERY AREA
- POOR TECHNIQUE

Active Capture/Scavenging (Preferred)

**Best** — Work in a fume hood or hard-ducted **Class II B2 biosafety cabinet** (BSC).

**Better** — Use **ducted active scavenging** devices (e.g., exhausted induction chamber/surgery nose cone or snorkel trunk ducted to the building’s exhaust system). **Do NOT use the house vacuum line for active scavenging unless approved by EH&S.** Cal/OSHA requires annual testing of building exhaust systems used to prevent harmful exposure. Contact EH&S at 310-825-5689.

**Good** — Use **ductless active scavenging** with a manufacturer-recommended air cleaning extraction system and activated charcoal adsorption unit. Certify the system according to the manufacturer’s recommendation.

Passive Scavenging (Less Effective)

**Sufficient** — Charcoal canisters rely on positive pressure from equipment and the anesthetized animal’s exhalation to push WAGs into adsorption units. Leaks in passive scavenging systems release WAGs into the work area.
Anesthetic Equipment Maintenance

Anesthesia machines and vaporizers must be maintained annually and certified every 3 years. For assistance in setting up gas anesthesia equipment, contact DLAM at 310-825-5363. Inspect the induction chamber seal and replace as necessary. Establish written procedures for daily and routine inspection/maintenance of anesthesia and scavenging systems.

Checklist for Working with Anesthetic Gas

☐ Ensure personnel receive and document training on equipment use.
☐ Review and understand the manufacturer’s instructions for operating the equipment.
☐ Use a certified local exhaust ventilation system (chemical fume hood, downdraft table/sink, etc.) as the preferred means to remove WAGs. Among BSCs, only hard-ducted Class II B2 units effectively remove WAGs from the room.
☐ Verify equipment (e.g., fume hood and vaporizer) is currently certified and in working condition.
  ☐ Check equipment for leaks using a refrigerant leak detector or by pressure testing (run air through the machine and spray suspected leaks with soapy water). Replace defective gaskets, valves, and tubing.
  ☐ Ensure connections are properly secured.
  ☐ Verify preventative maintenance has been performed annually or more frequently per the manufacturer.
☐ Fill vaporizer with the specific anesthetic for which it is certified either in a fume hood or using an anti-spill bottle adaptor. Use chemical-resistant gloves, lab coat, and eye protection.
☐ Keep laboratory doors closed when anesthetic gas is in use.
☐ Avoid high concentrations of isoflurane (>4%) for induction and/or for prolonged periods. Turn off vaporizer when animals are not receiving anesthetic.
☐ Close induction chamber lid(s) during anesthetic gas delivery. To open the chamber door, stand back as far as feasible and open away from worker. Sliding-top chambers are best.
☐ Once the animal is anesthetized in the chamber, close isoflurane and flush the chamber with oxygen for 3-5 seconds by increasing the oxygen rate to 1 L/min.
☐ Minimize leakage from animal’s nose cone by selecting the best-fitting cone size with a tight-fitting diaphragm.
☐ Keep WAG capture/collection devices as close as possible to points of release (e.g., animal face mask/nose cone).
☐ Keep worker’s breathing zone as far as possible from animal’s face mask.

Respiratory Protection

If options for scavenging are limited, personal respiratory protection may be necessary for researcher/employee health protection. Consult with EH&S by calling 310-825-5689.

Charcoal Canisters

- Follow manufacturer recommendations.
- Record weight before and after each use.
- Confirm that the canister is correctly connected to the breathing system.
- Use one canister for the face mask and another for the induction chamber.
- Operate F/Air canisters upright and elevated off a flat surface, as the exhaust port is on the bottom. VaporGuard canisters have exhaust ports on top.

Spills and Waste

Spills — Do not attempt to clean up isoflurane spills. Evacuate personnel and allow anesthetic to evaporate. Call EH&S (310-825-9797) for support with large spills (1–2 stock bottles).

Waste — Dispose of charcoal canisters as hazardous waste. Empty bottles may be triple-rinsed (in a fume hood), defaced, and disposed of as non-hazardous glass waste.